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Note, however, that each situation should receive careful individual study not only to ensure the effectiveness of control measures in the area of concern, but also to ensure that groynes, breakwaters, etc. do not create new problems in adjacent shoreline areas.

Where erosion problems exist, a united front is a must. Where there is no concerted plan of attack erosion control is much less effective. Land-owners with erosion problems should combine with their neighbours to adopt an overall plan based on competent advice which should provide an economical and satisfactory solution.



Collective and concerted action would be preferable to rugged individualism.

Sources of Information

The federal Department of the Environment through the programmes of the Inland Waters and Marine Sciences Directorates at the Canada Centre for Inland Waters obtains and compiles information on lake levels, waves, shore materials, shoreline surveys, nearshore currents and sediment transport. Hydrographic charts, data and information are available for most navigable waters at the "Marine Information Centre".

Canada Centre for Inland Waters, 867 Lakeshore Road, Burlington, Ontario. The Department of the Environment however, does not provide specific engineering services and recommends that these be obtained from consulting engineers near the area involved.

The Ontario Ministry of Natural Resources provides an extension service on erosion control offered through its Engineering Services Branch, Room W5620, Whitney Block, Parliament Buildings, Toronto, Ontario. This service is limited to the investigation of instances of erosion brought to the attention of the Ministry and to offering advice on means to combat erosion and permit accretion, consistent with the capital investment proposed by the person making the enquiry. For those interested in further reading we recommend:

1. Beaches and Coasts by A. C. King
2nd edition (London) Edward Arnold 1972
2. Processes of Coastal Development by
V. Zenkovich (New York Interscience 1967)

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Canada Centre for Inland Waters
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Honourable Jack Davis, Minister
Robert F. Shaw, Deputy Minister

Shore Erosion

cause and cure

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The picture shows the vertical erosion of soft material which has insufficient beach protection.

Erosion of land along the shores of oceans and lakes is a natural phenomenon. Simply stated, the basic cause of erosion is water movement occurring as flow on the surface, seepage through the ground and as waves on the shore. All cause soil particles to be carried to another location. For control methods to be effective, it is important to clearly understand the processes which bring about erosion.

The rate of shore erosion depends mainly on the type of soil and the exposure of the shore to waves and currents.

Shores composed mainly of silts and clays erode more rapidly to form vertical banks than do sand or gravel shores. Usually in the latter situation a protective beach is formed to absorb much of the wave force.

The rate of erosion is affected not only by waves but also by long-term variations in mean water levels. Higher water levels may enable waves to attack the shore or bank because the beach normally giving protection is submerged. Ice and cold weather often have beneficial effects on erosion. Winter storms are unable to erode the frozen ground and ice may prevent wave build-up. In spring, however, the release of frozen water often causes softening and slumping which, combined with high water levels and spring storms can cause rapid erosion.

Control of Erosion

Beaches are dynamic and material is in constant motion along the shore. Waves striking the shore at an angle cause beach material to move in directions both perpendicular and parallel to the shoreline. This parallel movement, known as littoral drift, can build up protective beaches with sand carried from eroding coasts or the mouth of creeks and rivers. Construction of shore protection works, long piers or dams can alter the balance of supply and demand causing beaches to recede or widen.

Erosion can be reduced or controlled by two main methods used either separately or jointly. First, waves may be prevented from reaching the affected area by using long piers or offshore breakwaters. If the breakwaters are floating structures some of the incident wave energy is always transmitted to the shore. In the second method the shore may be armoured or protected to resist wave attack. Armouring may be solid, such as a concrete wall, or permeable, such as rocks piled randomly along the shore, or gabions which are wire baskets filled with stone.

Permeable shore protection is preferable because it absorbs the wave energy rather than reflecting it and elaborate foundations are not required. Provision, however, must be made to prevent loss of fine soil material through the coarse protective material by the action of waves and seepage.

Vertical concrete or masonry walls provide effective protection but must be made higher than a permeable wall because of wave reflection.



Rock filled gabions offer the possibility of constructing a permeable shore protection with less material.

Foundations must be carefully designed and installed to prevent undercutting by wave action. Furthermore, the wave reflected from the wall can cause confused waves in front of the walls which may result in difficulties for small boats. All direct armouring methods reduce access to the shore, may be unpleasant to the eye and require special provisions for boat landing and swimming.

A very effective method of shore protection is to replicate nature by filling an eroding area with sand or gravel to create an artificial beach. Coarse gravel will make a steeper beach than fine sand and obviously reduce the volume required. Filling can proceed simply in stages until a sufficient quantity is deposited to provide protection. Because of littoral drift it is usually necessary to prevent lateral loss of material by building small piers or groynes perpendicular to the shore at each end of the beach. Some annual replacement may be required. This method is usually not expensive and does not require excessive capital outlays. The beach also provides access to the water and causes wave energy to be dissipated in breaking. The final slope of the beach depends on wave action.

We invite your enquiries concerning our public speaking service or visits to the Centre. We also welcome requests for further free information about water management in Canada, or about the work of other elements of Environment Canada. Simply complete the other side of this detachable slip and mail to:

Public Relations Unit
Canada Centre for Inland Waters
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